#### FIGURE 1

$$R \underset{H}{\underbrace{\downarrow}} \underset{H}{\underbrace{\downarrow}} NH_{2}$$

hydrazine

semicarbazide

$$R \underset{O}{\overset{H}{\underset{N}{\bigvee}}} NH_{2}$$

$$\begin{array}{c|c} R & S & NH_2 \\ N & N & NH_2 \end{array}$$

hydrazide

thiosemicarbazide

thiocarbazide

$$\begin{array}{c|c}
O & H & H \\
R & N & N & N \\
I & I & N \\
H & H & O
\end{array}$$

$$R \longrightarrow NH_2$$

hydrazine carboxylate

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# FIGURE 2

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### FIGURE 3

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# FIGURE 4

23. 3. 33

#### FIGURE 5

Preparation of 5'-aromatic aldehyde-modified oligonucleotide:

Preparation of 5'-heteroaromatic hydrazine-modified oligonucleotide:

 $\mathcal{X}_{\tau}$ 

Conjugation of hydrazino-modified oligonucleotide to aldehyde-modified oligonucleotide

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# FIGURE 6

phosgene, Et3N, THF

$$OCN$$
 $OCN$ 
 $OCN$ 

2.7

t-butyl carbazate, THF

1) HCl/dioxane

$$\begin{array}{c|c}
 & O \\
 & N \\$$

NHS, DCC, THF

# FIGURE 7

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# FIGURE 8

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# FIGURE 9

ONH<sub>2</sub>.HCl

ONHBOC